



July 2023 Northeastern United States floods

The **July 2023 Northeastern United States floods**, also known as the **Great Vermont Flood of 10–11 July 2023** in Vermont, was a destructive and significant flash flood event occurring in the Northeastern United States from July 9 to 29, 2023. Slow-moving showers and thunderstorms produced heavy rainfall and flooding, which led to widespread damage across multiple states in the Mid-Atlantic, with the heaviest and most destructive flash flooding centered around northern New England, specifically Vermont.^[2] Across the affected areas, numerous roads and bridges were washed out, and dozens of water rescues were conducted. Widespread rainfall amounts of 5 inches (130 mm) fell across the Northeast, with the maximum amount of rainfall occurring in Putnam Valley, New York, with 10.49 inches (266 mm).^[3] Downtown Montpelier, Vermont was flooded, as numerous state roads around the city were closed. The flash floods caused 13 fatalities across several states and \$2.2 billion in damage.

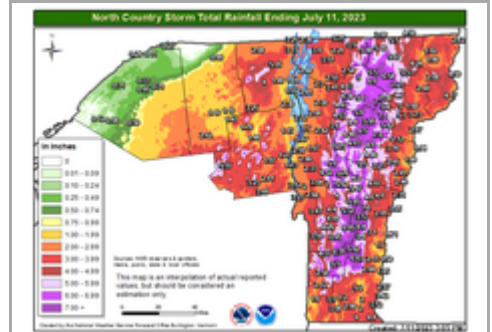
Meteorological history

On July 10, areas where the flooding occurred were already saturated by recent rainfall several weeks prior, and a large area of moisture traveled from the Atlantic Ocean to the Northeastern United States, likely contributed by warm waters of the Atlantic Ocean, where moisture evaporated and produced additional rainfall over New England.^[4] The storm, producing heavy rainfall, eventually slowed over the northeastern United States due to a large high pressure area over Greenland, which stalled the storm bringing high rainfall rates.^[4]

Flash flooding occurred again on July 16 following slow-moving showers and thunderstorms which developed along a cold front, which moved parallel to a deep southwesterly flow, causing the slow motion.^[5] Most unstable convective available potential energy in the 1500 j/kg range, along with moderate convective instability, maintained by the southwesterly flow, yielded re-development of the slow-moving showers and thunderstorms, and precipitable water around the 1.8-inch values also allowed the storms to produce heavy rainfall across portions of the Northeast.^[5]

On July 21, additional flash flooding occurred after a combination of a strong convergence zone and strengthening instability led to heavy rainfall-producing thunderstorms across portions of New England.^[6] Precipitable water values in the 1.5-1.7-inch range also allowed favorable conditions for very heavy

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Map of rainfall accumulations in the NWS Burlington's area of responsibility (Vermont and far northeastern New York) for the period July 9–11

Cause	Heavy rains
Meteorological history	
Duration	July 9, 2023 – July 29, 2023
Flood	
Maximum rainfall	10.49 in (266 mm) in <u>Putnam Valley, New York</u> on July 10
Overall effects	
Fatalities	13
Damage	\$2.2 billion (2023 USD) ^[1]
Areas affected	<u>Northeastern United States</u> (particularly <u>New York</u> and <u>Vermont</u>)

thunderstorm development.^[6] The same precipitable water values, combined with an unstable moist environment, 1500 j/kg convective available potential energy (CAPE) values, and dew points in the 60–70 °F (16–21 °C) range caused additional thunderstorm development on July 29 producing heavy rainfall, leading to flash flooding.^[7]

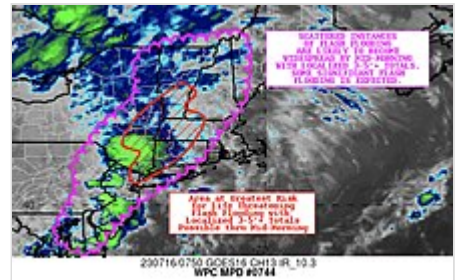
Preparations and impact

New York

Prior to the floods, New York Governor Kathy Hochul urged people to be aware of the weather and road conditions.^[8]

Flooding occurred at the United States Military Academy, inundating vehicles and forcing drivers to swim out of them. Multiple water rescues, mudslides, and flooded roads prompted the town of Cornwall to issue a No Travel Advisory.^[9] Portions of U.S. Route 9W and Palisades Interstate Parkway were washed out or collapsed and closed.^[10] Portions of New York State Route 218 were totally washed away by the floods.^[11] Areas near the Hudson River and in the Hudson Valley were flooded as a rare flash flood emergency was issued.^[12] A New York City-bound Amtrak train was stopped at Poughkeepsie due to reports of the train tracks south of Poughkeepsie being washed out, cutting off access to New York City, and was reversed and rerouted back to Rhinecliff.^[13] Amtrak Service was also suspended between New York City and Albany,^[14] as well as service from New York City to Burlington, Vermont also being suspended.^[15] In Saratoga County, U.S. Route 4 and New York State Route 32 were flooded with 2 ft (61 cm) of rainfall.^[13] Train service on Metro-North Railroad Hudson Line were stopped between Croton–Harmon and Poughkeepsie because of downed trees and damaged tracks.^[16] Due to the heavy rainfall, New York governor Kathy Hochul issued a state of emergency for Orange County, where 8 in (200 mm) of rain fell on Highland Falls and West Point in the eastern corner of the county.^[17] Significant flooding also occurred in Stony Point, where water rescues occurred and several homes and a park were flooded.^[18] Highland Falls also experienced significant flooding, with numerous streets in Highland Falls flooded and access to Highland Falls from Interstate 87 and U.S. Route 6 were closed due to flooding.^[19] Newburgh–Beacon Ferry Service was unavailable on July 10. CSX Tracks were compromised in 10 locations, with washed-out tracks between Selkirk and New Jersey.^[20] Roads were washed out in Carmel as well.^[20]

1,000 flights across New York airports, including LaGuardia Airport and John F. Kennedy International Airport, were cancelled, and more than 200 were delayed across those two airports.^[21] Rainfall in the Bronx forced a brief delay in an MLB game between the New York Yankees and Chicago Cubs.^[22] A 43-year-old woman drowned after being swept away by floodwaters in Highland Falls.^{[23][24]}



A mesoscale discussion from the Weather Prediction Center showing the risk of life-threatening flash floods during July 16.



A flooded road in Orange County, New York overlooking the Hudson River

Governor Hochul stated that damage would likely exceed \$37 million, the threshold for a federal disaster declaration.^[25] New York United States Senator Chuck Schumer said on July 17 that the damage to West Point alone was in excess of \$100 million according to the United States Army Corps of Engineers.^[26]

On July 16, additional flash floods affected the New York metropolitan area, this time focused on Long Island. Ground stops were imposed at LaGuardia Airport and John F. Kennedy International Airport.^[27] The flooding also led to a crash on New York State Route 27 late Sunday morning, injuring a police officer,^[28] with small parts highway shutting.^[29] Heavy rain also resulted in a baseball game between the Los Angeles Dodgers and New York Mets be delayed by over 3 hours.^[30] In Islip, 3.04 in (77 mm) of rain poured down in one hour, causing flooding across roadways in and around Islip and in Suffolk County.^{[31][32][33]}

Connecticut

On July 10, Norfolk issued an emergency declaration due to significant flooding in the area, washing out roads.^{[34][35]} Flooding and downed trees forced road closures in Greenwich, Danbury, New Milford, and Ridgefield.^{[36][37]} Homes in Kent were evacuated.^[38] Numerous flash flood warnings were issued for portions of Connecticut, including Greenwich and Stamford.^[39] Flash flooding also resulted in the closures of J.A. Minetto State Park and Indian Well State Park.^[40] Rainfall peaked at 5.52 in (140 mm) in Warren.^[41]

On July 16, additional flooding occurred across the state, where the terminal at Tweed New Haven Airport was shut down, and numerous streets were flooded in Connecticut,^[42] including Bristol, where six water rescues occurred.^[43] The Connecticut River flooded, causing damage to locations near the river,^[44] including near Glastonbury.^{[45][46]} The Pequabuck River also overflowed; causing road damage near the intersection of Connecticut state routes 72 and 229.^[47] Numerous state roads were closed as well due to flooding.^[48]

Massachusetts

On July 16, flooding caused cars to be stranded in an underpass on U.S. Route 20 in Worcester, and emergency crews pumped out water from several flooded basements in Fitchburg.^[49] Roads were washed out and yards were flooded there as well, and widespread property damage occurred.^{[49][50]} Gas lines were shut off near Fitchburg, and drains were clogged in the area as well.^[51] Pavement on roads buckled in Fitchburg,^[51] and pavement also sunk in Sturbridge.^[50] A person died due to hydroplaning in Interstate 93 in Wilmington.^[52]

On July 21, flash flooding affected the Boston metropolitan area. A baseball game between the Boston Red Sox and New York Mets was suspended in the 4th inning as a result of the exceptionally heavy rain that sent water cascading down stairs at Fenway Park.^[53] Boston Logan International Airport recorded 1.75 in (44 mm) of rain in just over an hour.^[54] Further west, numerous vehicles were inundated by floodwaters across many U.S. routes and Massachusetts routes, with the flooding forcing portions of U.S. Route 1 and several Massachusetts routes to close.^[55] The heaviest rainfall occurred in Franklin County, with Conway receiving 7 in (180 mm) of rain and 5.41 in (137 mm) of rain fell in Montague.^[55] Vermont train service was halted after a side track was washed out in Deerfield.^[56]

On July 29, additional flooding occurred in Massachusetts, including Roxbury, where vehicles were flooded and one person was seriously injured.^[57] Flooding occurred on portions of Interstate 93, and streets were flooded throughout the Boston Metropolitan Area, where cars were stalled in floodwaters.^[58] 3 in (76 mm) of rain poured down in Boston that night, and Andover received 3.18 in (81 mm) of rain.^{[59][60]} Boston set a daily rainfall record on July 29.^[61]

Local state of emergencies were declared in nearly a dozen towns, including Williamsburg, where emergency crews conducted water rescues there.^[62]

New Hampshire

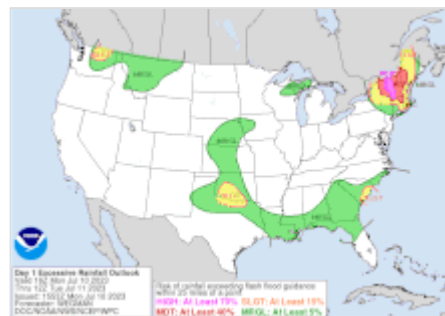
Numerous roads in New Hampshire were closed due to flooding.^{[63][64]} The Crayon 301 NASCAR race was postponed due to flash floods on July 16.^[65] The Forest Lake Dam in Winchester failed on July 10, causing water levels to drop by 4 ft (1.2 m).^[66]

The Mall of New Hampshire delayed its opening hours on July 16.^[67] In Manchester, roads and basements were flooded, and mall parking lots were flooded, inundating vehicles.^[68] Pavement on roads buckled in Hillsborough due to flooding.^[69] Flash flood warnings were issued for portions of the state, and more flash flood warnings were issued in July 2023 alone than any other full year on record.^[70]

Vermont

On July 9, 2023, Vermont governor Phil Scott issued a state of emergency.^[71] On July 10, the Weather Prediction Center issued their first ever high risk for flash flooding in the NWS Burlington coverage zone.^[72] The National Weather Service also issued their first flash flood emergency not just for Vermont, but for anywhere in Northern New England.^[73] The same day, residents in Montpelier were urged to evacuate low-lying areas and areas near the Winooski River.^[74] The next day, roads were flooded and a garage was leveled in Ludlow, and basements were flooded in Barton. Portions of Interstate 89 and Vermont Route 16 were closed.^{[75][76]} Flooding also occurred in Londonderry and Weston, where both towns were inaccessible.^[77] 44 people required water rescues.^[78] About a dozen campers in Andover were rescued by swift boat after the bridge entering and exiting out of Andover was washed out.^[79] Rainfall totals reached 9.61 in (244 mm) in Calais.^[80] Vermont's Secretary of Agriculture, Food, and Markets Anson Tebbetts described the damage as being worse than that of Hurricane Irene in 2011.^[81] On July 11, water levels at the Wrightsville Dam crested, threatening to burst the dam or necessitating to open a spillway. By evening levels receded.^[82]

Thunder Road International SpeedBowl in Barre was scheduled to host the second event of the 2023 Superstar Racing Experience auto racing season on July 20, but the event was cancelled as result



The Weather Prediction Center's excessive rainfall outlook for July 10. This outlook included a rare Level 4–High Risk for most of Vermont.



Flooding in downtown Montpelier, Vermont as photographed by the United States Air National Guard

of the floods, with week 2 of the competition moving to Stafford Motor Speedway in Connecticut on the same day as the scheduled Thunder Road race. SRX will make its debut at the SpeedBowl in 2024.^[83]

Three deaths occurred; one in Barre,^[84] one in the Huntington River,^[85] and one on the Appalachian Trail near Stockbridge.^[86]

Rhode Island

On July 10, flooding closed Rhode Island Route 10, and Rhode Island State Police assisted with stalled vehicles.^[87] Flash flooding occurred in East Providence, Providence, and Cranston.^[88] Snowplows were deployed in Providence to push floodwaters.^[89]

On July 16, flooding forced closures on portions of Interstate 95, and Rhode Island Route 10, and roads in East Providence were flooded and impassable.^[90]

Pennsylvania

Flooding and water rescues occurred in Reading, along with vehicles submerged and downed wires occurring in Upper Merion Township and Conshohocken.^[91] A baseball game between the York Revolution and the Lexington Counter Clocks was postponed.^[92] Flooding washed out roads in Quakertown.^[93]

On July 15, seven people were killed due to flash flooding in Upper Makefield Township in Bucks County.^{[94][95]} Up to 7 in (180 mm) of rain fell down in 45 minutes in the surrounding area.^[96] Pennsylvania Route 532, the road where the accident occurred, shut down for two weeks following the flooding.^[97] On July 16, an MLB game between the Philadelphia Phillies and San Diego Padres was delayed due to the rain.^[98]

North Carolina

Flooding and damage was reported in the Greensboro and Burlington areas, where a shopping center and a softball field was flooded. Trees and power lines were down as well, and 15,000 power outages occurred across the state as numerous severe thunderstorm and flash flood warnings were issued.^[99] On July 15, a woman was killed in a flooded road in Alexander County.^[100]

Elsewhere

At Newark Liberty International Airport near Newark, New Jersey, 367 flights were cancelled and an additional 477 were delayed on July 16.^[31] A portion of New Jersey Route 46 closed after a landslide developed on the side of the highway.^[101]

Aftermath

The American Red Cross and the Hudson Valley Chapter opened a shelter in Highland Falls, New York.^[102] The American Red Cross and the Reading Fire Department assisted in water rescues in Reading, Pennsylvania and an emergency shelter was opened at an elementary school in the city.^[103] Due to storm

damage, Bear Mountain State Park and Harriman State Park were closed.^[20] An emergency shelter was opened in Barre.^[76] President Joe Biden declared a state of emergency for Vermont and ordered federal assistance to help with relief efforts.^[104]

On July 11, New Hampshire governor Chris Sununu toured and surveyed flood-damaged areas, including the failed Forest Lake Dam.^[66] The Federal Emergency Management Agency assessed damage around New Hampshire, including Antrim from July 11, continuing through the week of July 25 as well.^{[66][105]}

On July 12, Massachusetts governor Maura Healey toured the flooding damage in Williamsburg, and offered state assistance.^[106] Healey also spoke with the Massachusetts Emergency Management Agency regarding the floods.^[106]

On July 16, Connecticut governor Ned Lamont toured Bristol, Connecticut, and stated that engineers would assess road damage.^[107] Chuck Schumer and Kirsten Gillibrand, U.S. Senators from New York, and Pat Ryan, U.S. representative from New York's 18th congressional district, were given an aerial tour of the United States Military Academy and the surrounding area to survey the storm damage on July 17.^[26]

On August 1, following the flooding, the United States Department of Agriculture designated seven counties in Massachusetts as disaster areas.^[108] Also on August 1, the Tennessee Emergency Management Agency deployed two personnel to Vermont to aid in the aftermath of the flooding in Vermont.^[109] The day after, Massachusetts governor Healey signed a supplemental budget of \$20 million to aid in Massachusetts farms which were impacted by the flooding.^[110] On August 3, U.S. senator Ed Markey visited flooded areas in Conway, Massachusetts, and announced a climate bill.^[111]

Vermont band Phish raised over \$3,500,000 through benefit concerts for flood relief in their home state.^[112]



U.S. Senators from New York Chuck Schumer and Kirsten Gillibrand and U.S. representative from New York's 18th congressional district Pat Ryan speak at the United States Military Academy after receiving a tour of storm damage.

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